Kapunakea Preserve

West Maui, Hawai‘i

Long-Range Management Plan
Fiscal Years 2004–2009

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Department of Land & Natural Resources
Natural Area Partnership Program

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EXECUTIVE SUMMARY

The Nature Conservancy of Hawai‘i (TNCH) is the Hawai‘i Chapter of The Nature Conservancy (TNC), an international private, non-profit organization based in Arlington, Virginia. The mission of The Nature Conservancy is to preserve the plants, animals, and natural communities that make up the diversity of life on Earth by protecting the lands and waters they need to survive. Since 1980, TNCH has helped protect more than 200,000 acres across the state. It has a statewide system of 12 preserves totaling 30,000 acres and has helped protect another 175,000 acres through cooperative projects with federal, state, county, and private partners. On Maui, TNCH manages two preserves, Waikamoi and Kapunakea, and also cooperates in the management of the 8,600-acre Pu‘u Kukui Watershed Management Area (WMA).

The State's Natural Area Partnership (NAP) Program (NAPP) is an innovative funding mechanism that aids private landowners in the management of their native ecosystems. NAPP provides matching funds ($2 state to $1 private) for the management of qualified private lands that have been permanently dedicated to conservation.

Kapunakea was approved for NAPP funding in 1992, and soon thereafter TNCH implemented the management programs described in our initial plan, *Kapunakea Preserve FY1992 – FY1997 Long-Range Management Plan.* Initial management work was conducted under an emergency authorization (file no. 92-509) granted by the State Department of Land and Natural Resources in March 1992. In 1995, an environmental assessment was completed *(Final Environmental Assessment for Kapunakea Preserve Natural Area Partnership, 1995*). Subsequently, in 1997, NAPP funding for a new 6-year period was reauthorized following a renewal procedure which included the preparation of an updated plan (*Kapunakea Preserve FY1998 - FY2003 Long-Range Management Plan)* and another environmental assessment *(Final Environmental Assessment for Kapunakea Preserve Natural Area Partnership, 1997*). Presently, TNCH is seeking reauthorization of NAPP funding for the next 6-year period for the programs described within this *Kapunakea Preserve FY2004 – FY2009 Long-Range Management Plan*. This plan continues the programs implemented under the previous plans and environmental assessments. Herein, we request **$791,888** in matched state funds for the 6 years spanning FY2004 – 2009.

Over the next six years our management efforts will focus on the following activities:

1. **Ungulate control** – TNCH's primary management activity in Kapunakea will continue to be the removal of all ungulates from the preserve. Pigs are the primary targets of our removal programs, but axis deer and goats will also be targeted if they are found to be in the preserve. This program will continue to utilize a combination of fencing, hunting, and snaring to remove pig populations, with snaring being the most effective and feasible technique for eliminating pigs. Hunting has been used for pig control in Kapunakea and was found to be somewhat effective initially but was not effective as a long-term strategy. Staff hunting, and possibly contract hunting, will most likely be used to remove deer and goats when they are found. We will also continue to conduct ungulate monitoring as part of our routine field operations, and maintain fences as necessary.

   Invasive Plant Control – The most important aspect of this program continues to be controlling established weeds in intact native communities, along with preventing the introduction of additional

alien plants. As part of our routine management program, TNCH will continue to control habitat-modifying weeds at strategic locations. We will update and maintain priority weed maps and aerial survey data as necessary.

Small Mammal Control – A goal of the program continues to be preventing small mammals, predominantly rats (*Rattus* spp.), mongooses (*Herpestes auropunctatus*), and feral cats (*Felis catus*), from damaging rare native species in the preserve. TNCH will continue to follow strict procedures for preventing the introduction of new non-native invertebrates and small mammals, which mainly includes routine inspection and training. Additionally, TNCH will support the development of effective control techniques for small mammals by encouraging research in this area. To some extent, trapping and/or baiting may be performed in accordance with State policy.

2. **Resource Monitoring** – Monitoring is imperative to providing data that can be used to guide management programs at Kapunakea Preserve. We will continue to track biological and physical resources at the preserve and evaluate changes in these resources over time in order to identify new threats before they become established. Currently our vegetation monitoring is under review by TNC's Science Team. Any changes to the vegetation monitoring will be reported in the Operational Plans for Kapunakea Preserve.

3. **Rare Species Protection and Research** – To date, 22 rare plant and 4 rare land snail species have been reported from Kapunakea, based on data provided by the Hawai'i Natural Heritage Program (HINHP). Protecting habitat essential to the majority of the preserve's native plants and animals continues to be our primary enhancement strategy. We will also continue to assess threats to the rarest species and take measures to protect them, when necessary. Staff will continue to search for rare plant populations during routine management activities, and maps will be updated to reflect rare species populations on a periodic basis.

4. **Community Outreach** – Our community outreach efforts are focused on developing conservation awareness on Maui and across the State of Hawai'i. Our outreach program takes a comprehensive approach and is based on four broad themes: linking conservation to people's lives; working at the grass-roots level to formulate a ground-up approach; building key relationships with members of the local community; and building the capacity of partner individuals and organizations. We will continue to recruit and train volunteers on an ongoing basis; additionally, we will conduct routine outreach visits and presentations to local community and school groups

5. **Watershed Partnerships** –The West Maui Mountains Watershed Partnership (WMMWP) was formed in 1998 to assist in protecting the island's watersheds by leveraging efforts between conservation partners. As an active member of this group, TNCH will continue to work with partners to promote stewardship activities in watershed regions.

The State Department of Land and Natural Resources (DLNR), which administers the NAP program, is kept apprised of our progress in the preserve through written reports and an annual inspection. Operational Plans and Progress Reports are submitted annually (the Conservancy has adopted a July 1 – June 30 fiscal year). These documents are available upon request to others who are interested.

The first section of this plan contains a brief overview of the native resources that are protected at Kapunakea Preserve. In the second section are management considerations that have shaped our

programs. Finally, each management program is discussed in turn. Program goals are followed by an explanation of the management method we have chosen and a brief summary of each program's past accomplishments. Objectives and costs for each program from FY2004 through 2009 are also listed.

RESOURCES SUMMARY

General Setting

Kapunakea Preserve was established in 1992 when Pioneer Mill Company, Ltd., a subsidiary of Amfac/JMB-Hawai‘i Inc., granted The Nature Conservancy a perpetual conservation easement over 1,264 acres on West Maui. The preserve’s upper elevations are recognized as among the highest quality native areas in the state. Kapunakea Preserve is adjacent to two other natural areas that are actively managed: Pu‘u Kukui WMA (which is privately owned and part of the NAP program) and the Honokowai section of the state West Maui Natural Area Reserve (NAR) (see Figure 1). These managed natural areas comprise more than 13,000 acres of contiguous, managed watershed.

Flora and Fauna

Kapunakea contains 10 native-dominated natural communities, ranging from lowland shrublands to montane forests and bogs, including the rare ‘Ohi‘a Mixed Montane Bog (Figure 2, Appendix 1). Four of the communities are not found in the nearby West Maui NAR, most notably Koa/‘ohi‘a (*Acacia koa/Metrosideros polymorpha*) Lowland Mesic Forest and Lama/‘ohi‘a (*Diospyros sandwicensis/Metrosideros polymorpha*) Lowland Mesic Forest.

The preserve is home to at least 24 species of rare plants, including 5 that are listed as endangered (Appendix 2). Sixteen of the 24 rare plants reported from Kapunakea have also been reported from the West Maui NAR, but the other 8 rare plants have not been seen in the NAR. Four native forest birds are found in Kapunakea: ‘apapane, ‘i‘iwi, ‘amakihi, and pueo. ‘Ua‘u have also been heard there. Populations of four species of rare Hawaiian tree snails have recently been documented at Kapunakea: *Partulina perdix, P. tappaniana, P. crocea*, and *Perdicella kuhnsi* (Appendix 3). These snails probably were once widespread and abundant on Maui, but in many areas their numbers have declined precipitously in this century due to habitat destruction, collection, and the depredations of introduced animals. A number of other snails also occur at Kapunakea, including tornatellinines and species of *Auriculella, Succinea,* and *Philonesia*.

MANAGEMENT

Management Considerations

1. The primary strategy for protection of Kapunakea is to prevent the further introduction and/or spread of destructive alien species. Special care must be taken to avoid negative side effects of management activities. For example, trails and management activities are designed to prevent further weed and ungulate invasion. This strategy requires helicopter access to most parts of the preserve. Interpretive and educational uses are limited in scope. Guidelines are followed to minimize impacts such as trampling and weed dispersal.

2. The preserve is bounded on the west (lowland) side by private agricultural lands. Activities related to agricultural production (large, heavily loaded trucks, agricultural burning, etc.) pose a risk to preserve users. As a result, public access is somewhat limited, and we carefully coordinate our management and interpretive activities with work in adjacent agricultural areas.

3. Kapunakea is remote and rugged. Given limited resources, the entire preserve cannot be managed equally. Management is concentrated at the most urgent threats (e.g. halting pig ingress), and in areas that contain special plants, animals, and native natural communities (e.g. the rare montane bog community).

4. Kapunakea Preserve is adjacent to two areas that are also managed to protect natural resources: Pu‘u Kukui WMA (privately owned) and the Honokowai section of the state West Maui NAR (Figure 1). TNCH currently acts as a consultant to Maui Land and Pineapple Co., managers of Pu‘u Kukui WMA, and has a Master Cooperative Agreement with the State Division of Forestry and Wildlife. These agreements are used to coordinate management and sharing of staff, equipment, and expertise in order to maximize management efficiency.

Management Units

Kapunakea is managed as five units (Figure 3) defined by topographic boundaries, similarity of natural community types, and threats.

1. Unit 1 consists of the lowland (up to 3,000 feet elevation) portion of the preserve that is closest to Kapaloa Stream. It is primarily comprised of ‘Ohi‘a Lowland Wet Forest and Uluhe (*Dicranopteris linearis*) Lowland Wet Shrubland. Prior to our management efforts, this unit showed high levels of pig activity. Activity has been significantly reduced by control measures that must be maintained to keep activity low.

2. Unit 2 encompasses the remainder of the preserve’s lowland elevations. It contains five native communities, and non-native vegetation in the gulch bottoms. Because *Tibouchina* and strawberry guava are prevalent throughout the unit, we aim to prevent their spread into other units, rather than eliminate them from Unit 2. Pig activity, although high during the initial phases of ungulate control, has been reduced substantially.

3. Unit 3 comprises the majority of the preserve's mid-elevations (3,000 – 4,000 feet) and follows Kapaloa Stream along its northeast boundary. The four montane communities in Unit 3 are dominated by Uluhe or ʻOhiʻa; Mamaki (*Pipturus albidus*) Lowland Wet Shrubland occurs along the streambed. The Uluhe and ʻOhiʻa dominated communities are intact above 3,400 feet, with minimal weed problems. Our management focus in this unit is to eliminate ungulates and control weed invasions.

4. Unit 4 begins on the east side of Kapaloa Stream, and continues to the preserve's eastern boundary. The upper elevations in this unit must be reached by helicopter, due to the steep gulch walls. Management focuses on preventing new invasions.

5. Unit 5, encompassing the highest elevations of the preserve, is Kapunakea's most pristine unit. Initial survey data and more recent monitoring results have shown that this area contains only a few scattered alien plants (including *Tibouchina*). The management priority is to remove threats from this area before they damage the rare ʻOhiʻa bogs. Like Unit 4, access is by helicopter. Travel is conducted from the upper elevations down to avoid transport of weeds that occur in lower elevations.

Management Programs

Although the following management programs are described separately, they form an integrated management approach. For each program listed in the following section, we have indicated a major goal and described the management methods chosen. Also included are highlights of past and current achievements, along with key management issues. Finally, objectives and costs for FY2004–FY2009 are listed. Staff time and effort, along with equipment expenses, are included separately within the 'Personnel, Equipment, and Facilities' program section.

Program 1: Non-native Species Control

A. Ungulate Control

Program Goal
Remove all ungulates and prevent future invasion.

Discussion of Methodology
Pig activity (as measured by the presence or absence of fresh sign along seven ungulate monitoring transects) declined from 34% in 1994 to 0% in 1995, seeming to indicate successful elimination. However, by January 1996, activity rebounded to 26%. It is now known that pigs continue to find their way into the preserve from adjacent lands. Therefore, the elimination of ungulates in Kapunakea Preserve and on adjacent partnership lands continues to be our highest priority. Some resources may be shifted to weed control should we deem ungulate levels low enough to justify this shift. However, if ungulates reappear in the preserve at any time, their control will again become our highest priority.

The ungulate control program utilizes a combination of fencing, hunting (primarily contract hunting), and snaring to bring pig populations down to zero as rapidly as possible and prevent them from re-establishing. While contract and volunteer hunting were used in the initial phases of ungulate removal,

it is not an effective tool at the current ungulate levels and has not been used since 2000. The lower boundary of the preserve was fenced in several phases between FY1993 and FY1995 (Figure 3). Also, a strategic fence constructed in FY1993 at 4,200 feet prevents pigs from moving into the bog areas. The WMMWP fencing crew recently completed an extension of the lower fence. We expect this approximately half-mile fence at Hahakea to further prevent pig ingress into Kapunakea from neighboring lands. In the coming years we my need to continue constructing short strategic fences at possible points of pig ingress.

Snaring is still the most effective and feasible technique for controlling pigs in areas too remote, rugged, and/or fragile for frequent hunting, and where hunting cannot remove low-density pig populations from sensitive sites. Until an effective alternative can be found, snares will continue to be placed in pig-damaged areas. Additionally, if warranted by high levels of pig activity, we will snare other areas of the preserve (and other strategic areas). All snares are checked semi-annually, and groups of snares are conspicuously marked in the field.

In the past few years, axis deer (*Axis axis*) have greatly expanded their range on Maui to include West Maui areas near Ukumehame, Kapalua, and Kahakuloa. Control efforts for axis deer may be needed in the near future to protect the preserve. Since cooperative interagency and private efforts are needed for successful long-term control of axis deer on Maui, we will continue to meet regularly with other members of the Maui Axis Deer Group (MADG) to seek solutions.

Following standards implemented in 1993 (Dunn, P. 1992, *Long-Term Biological Resource and Threat Monitoring of Hawaiian Natural Areas*, unpublished report prepared for the State Department of Land and Natural Resources, Division of Forestry and Wildlife), we have established a system of transects that extends the entire length of the preserve. (These are referred to throughout this document as resource/threat monitoring transects.) This system replaced a network of 500-meter-long ungulate and weed monitoring transects. We will gather data on animal activity and weed presence along the resource/threat monitoring transects once every year. We will also continue to record incidental observations of small mammal (cat, dog, mongoose) sign, and begin control as necessary. Currently TNCH is conducting an internal review of monitoring techniques. While this review is not expected to cause major changes in our monitoring programs, some adjustments may be made to increase the effectiveness of our monitoring techniques.

We will continue to: 1) survey for axis deer and goats on West Maui during routine helicopter operations; 2) assist the WMMWP and neighboring land managers with ungulate control efforts; and 3) participate as members of MADG and Maui Invasive Species Committee (MISC).

Activities

Years 1-6 (FY2004-09)

- Continue ungulate control throughout preserve and at other strategic locations. Assist WMMWP ungulate control crews as necessary.
- Maintain fences, and continue to scout for and add small strategic fences.

Travel – helicopter	$6,500
Fence materials and supplies	6,000
Subtotal (annually)	$12,500

B. Invasive Plant Control

Program Goal
Remove habitat-modifying weeds from high-quality native habitats; prevent introduction or spread of problem weeds.

Discussion of Methodology
The most important aspects of our weed control program are to control established weeds in intact native communities, and to prevent the introduction of new species of alien plants. (Elimination of ungulates is believed to be one of the most effective means of controlling the introduction and spread of habitat-modifying weeds.) In some cases, when weeds are considered a direct threat to rare plant populations occurring in alien dominant habitat, localized control actions may be taken.

We will continue to enforce strict procedures to remove weed seeds from equipment and clothing before people enter the preserve. Helicopter flights will originate from areas free of aggressive weeds, and all equipment and clothing will be inspected and cleaned. Of the alien plants already established in the preserve, many are shade intolerant and pose no major problem if the native forest canopy and ground cover remain intact. There are other alien plants, however, that displace native vegetation over large areas; these habitat-modifying plants are considered 'Priority Weeds' for management (Table 1). Based upon 10 years of experience with the dynamics of our weed populations, we revised our list of priority weeds in FY2003.

We will continue to control weeds manually (by pulling or cutting), chemically (using herbicide), or with a combination of manual and chemical control methods. Herbicide use is limited, and in full compliance with the State of Hawai'i Department of Agriculture (HDOA) Pesticide Enforcement Division. (Weed control staff are also certified through HDOA's Pesticide Enforcement Division.) All herbicide use is in accordance with the product label and recorded in detail for reference and efficacy monitoring.

Target Species:

Tibouchina herbacea is rapidly expanding its range over West Maui. It has become widely established in the lower half of the preserve over the last decade. People, pigs, and wind seem to be the primary vectors of this habitat-modifying weed. Due to our diligence at scouting for and treating *Tibouchina* above 3,200 feet, we have minimized its establishment at higher elevations, despite our expectations that the infestations would explode beyond our control. Our weed control efforts at Kapunakea focus primarily on *Tibouchina*, which is now a higher priority than strawberry guava because of its ability to invade a wider range of habitats and terrain, altering those habitats at a much faster rate. As feral pigs are the primary source for spreading strawberry guava, and we have significantly reduced pig numbers, the spread has slowed considerably. However, if *Tibouchina* expansion accelerates beyond our control, we may need to shift our focus to priority weeds that we can control more successfully. We will continue to track the Department of Agriculture's success in identifying safe biocontrol agents for *Tibouchina* and, upon their demonstrated effectiveness, we will seek in-house approval to release them

on TNC preserves. Dr. Tracy Johnson (Research Entomologist), who coordinates the biocontrol program at the Forest Service's quarantine facility in Volcano, has informed us that no biocontrol agents for *Tibouchina* have been approved for release, nor are any presently undergoing host-specificity tests at the facility. However, one potentially promising candidate has been identified, a beetle (*Syphrea uberabensis*), which consumes the roots and leaves of *Tibouchina herbacea*. Presently, a collaborating research facility in Brazil is trying to obtain these beetles from the wild and develop methodologies to rear them in the lab.

In the past 10 years, we have halted the spread of strawberry guava in lower Unit 3 by treating thousands of trees with herbicide, and pulling thousands of seedlings. We continue to scout for this pest tree in critical areas above 3,200 feet, where the spread is very limited.

Blackberry is widespread and continues to spread (primarily via birds), although our treatment of trailside plants has prevented it from gaining density along those routes. However, it continues to dominate habitat along steep gulches, where chemical control is impractical.

A tall thatch grass, *Andropogon virginicus* (Broomsedge), has recently presented Kapunakea with new challenges. Besides being a habitat-modifying plant, this grass also poses a serious wildfire threat as a medium fuel during drought periods. Mechanical and chemical control efforts have limited the dominance of this weed along trails, camps, and landing zones.

We have had success at containing and shrinking populations of Hilo grass (*Paspalum conjugatum*), and future efforts will focus on maintaining that status for this shade tolerant grass.

We routinely control selected priority weeds along trails, campsites, and landing zones above 3,200 feet elevation, limiting current infestations in otherwise intact forest or shrubland. This also serves to minimize spread of priority weeds to new places during other Preserve activities. We have scouted for, monitored and/or mapped populations of blackberry, *Tibouchina*, banyan (*Ficus* spp.), silk oak (*Grevillea robusta*), juniper (*Juniperus bermudiana*), *Passiflora suberosa*, strawberry guava, white ginger, and several grasses.

As part of our routine management program, we will continue to: 1) monitor for and control new weeds at landing zones, campsites, and upper trails; 2) train staff in the proper handling and application of herbicides; 3) assist neighboring land managers with weed control efforts; 4) participate as a member of the Maui Invasive Species Committee; 5) update aerial survey and range maps for juniper, banyan, silk oak, or other weeds as needed; and 6) cooperate with DOCARE in marijuana control as needed.

TABLE 1: Priority Weed Species in Kapunakea Preserve

Rank	Scientific Name	Common Name
1	*Tibouchina herbacea*	Tibouchina
2	*Rubus argutus*	Blackberry
3	*Psidium cattleianum*	Strawberry guava (waiawi)
4	*Paspalum conjugatum*	Hilo grass
5	*Rubus rosifolius*	Thimbleberry
6	*Andropogon virginicus*	Broomsedge
7	*Passiflora suberosa*	Passiflora
8	*Melinis minutiflora*	Molasses grass
Other Important Pest Species:		
-	*Ficus* spp.	Banyan
-	*Buddleia asiatica*	Butterfly bush
-	*Juniperus bermudiana*	Juniper
-	*Grevillea robusta*	Silk oak
-	*Setaria gracilis*	Yellow foxtail
-	*Holcus lanatus*	Velvet grass
-	*Axonopus fissifolius*	Carpet grass
-	*Juncus planifolius*	Bog rush
-	*Psidium guajava*	Guava
-	*Hedychium coronarium*	White ginger

Activities

Years 1-6 (FY2004-09)

- Continue treatment of top four habitat-modifying weeds.
- Monitor weeds as needed according to management priorities.
- Continue treatment of other listed priority weeds and respond to new weed threats.
- Update and maintain priority weed maps as needed.
- Assist WMMWP weed control crews as needed.

Travel - helicopter	$2,100
Supplies	750
Subtotal (annually)	$2,850

C. Small Mammal Control

Program Goal

Increase our understanding of threats posed by small mammals; reduce their negative impact where possible.

Discussion of Methodology

Non-native small mammals (rats [*Rattus* spp.], mongooses [*Herpestes auropunctatus*], feral cats [*Felis catus*], etc.) are potential major threats to native species and to ecosystem stability. In particular, rats are known to be destructive to native land snails. To assess the degree to which rats were impacting our snail populations, we experimented with diphacinone in tamper-proof bait stations. Unfortunately, valid conclusions could not be drawn from the data collected. (Although bait was taken from the stations, it was not clear if rats or some other animals were removing it). Moreover, in FY1998 we determined potential staffing and other requirements for continued baiting to be too high and would

impact the resources available for feral ungulate control. This excessive cost is largely due to helicopter use to access remote sites every 2-3 weeks.

In the event that resources become available to continue a baiting program at Kapunakea, we would so. In the meantime, we may use diphacinone on a more limited basis as the needs arises (e.g. around rare plants). The anti-coagulant diphacinone has been approved for use in natural areas in Hawai'i under a Section 24c registration (also known as a special local need registration). Any diphacinone use at Kapunakea or other West Maui sites will be in accordance with the special local need registration or with a State Department of Agriculture experimental use permit. Staff supervising work conducted under an experimental use permit must have a State Department of Agriculture Category 10 certification.

TNCH does support a long-term program aiming at protecting larger landscapes from small mammal depredation and has contributed toward trials that may result in the aerial application of rodenticide.

Activities

Years 1-6 (FY2004-09)

- Continue to support studies into aerial application of rodenticides.
- Support other scientific research into effects of small mammals and their effective control.

Program 2: Resource Monitoring

Program Goal

To track biological and physical resources of the preserve and evaluate changes in these resources over time; to identify new threats before they become established, and to promote research that guides management programs.

Discussion of Methodology

Resource monitoring differs from threat monitoring in that its purpose is to document and quantify natural resources (vegetation, birds, and invertebrates) and track them over time, identifying trends. Accurately quantifying changes in natural resources provides land managers with the information needed to determine the efficacy of past management programs and to plan future research and management in Kapunakea.

We use a network of monitoring plots to quantify and better understand Kapunakea's vegetation. The protocol implemented in 1993 calls for re-monitoring vegetation plots every 3 years. However, based on the very slow rate of vegetation change observed in these plots in similar natural areas, we have decided to conduct vegetation monitoring at Kapunakea only once every 10 years. We will, however, collect ungulate and weed data along these transects annually. Vegetation monitoring was last conducted in 1997 and is currently scheduled for FY2007.

The report, *Long-Term Biological Threat and Resource Monitoring, Kapunakea Preserve, West Maui* was completed in 1995. It has four parts: Vegetation Monitoring, Rare Plant Monitoring, Pest Plant Monitoring, and Feral Ungulate Monitoring. Our monitoring transects include: 1) 10,000 meters of permanent belt transects for monitoring the distribution, frequency, and relative abundance of feral

ungulates and alien plant species, and 2) 41 permanent, 250 square meter plots for obtaining in-depth quantitative data on forest vegetation. Bird surveys were conducted in 1993, 1994, and 1996 along the same transects by observers trained in the U.S. Fish and Wildlife Service's Hawai'i Forest Bird Survey methodology. The purpose of these surveys is to document the relative abundance of all bird species in the forest. In the future, we will conduct bird surveys only during the state's routine bird surveys (every 5 years).

Our science team is currently reviewing the vegetation monitoring techniques employed in Kapunakea and will likely recommend changes to the types of data collected and the method of collection. We will implement these changes when the review is completed. Any changes to vegetation monitoring will be reported on in the Kapunakea Operational Plan.

In fiscal year 2004 the Maui Field Office will assess the human impact on the 'Ohi'a Mixed Montane Bog. Resource monitoring and ungulate control crews go to the bogs only twice a year. Unfortunately this is not enough time for the section of bog located on our trail to fully recover from previous visits. To lessen our impacts in the bog, in fiscal year 2006 we will add a short, narrow viewing platform (about 100 meters long) and a small (11 feet by 11 feet) helispot (which will also aid in rescue). Additionally, we will reduce the number of visits and crew size.

Activities

Year 1 (FY2004)
- Monitor and maintain resource/threat monitoring transects once per year.
- Implement new vegetation monitoring schedule and data collection.
- Provide logistical support to researchers.
- Assess human impact on bog and recommend mitigation action.

Travel - helicopter	$700
Supplies	80
Subtotal	$780

Year 2 (FY2005)
- Monitor and maintain resource/threat monitoring transects once per year.
- Implement new vegetation monitoring schedule and data collection.
- Provide logistical support to researchers.

Travel - helicopter	$700
Supplies	80
Subtotal	$780

Year 3 (FY2006)
- Monitor and maintain resource/threat monitoring transects once per year.

- Implement new vegetation monitoring schedule and data collection.
- Provide logistical support to researchers.
- Implement mitigation action to reduce human impact on bog.

Travel - helicopter	$700
Supplies (contingent on boardwalk being selected as best mitigation action)	4,850
Subtotal	$5,550

Years 4-6 (FY2007-09)
- Monitor and maintain resource/threat monitoring transects once per year.
- Implement new vegetation monitoring schedule and data collection.
- Provide logistical support to researchers.

Travel - helicopter	$700
Supplies	80
Subtotal (annually)	$780

Program 3: Rare Species Protection and Research

Program Goal
Prevent the extinction of rare species in the preserve.

Discussion of Methodology
Kapunakea protects at least 24 rare plants and 4 species of rare land snails (see Appendices 2 and 3). TNCH uses data compiled by the Hawai'i Natural Heritage Program (HINHP) to identify rare species, and uses the HINHP definition of rare species that exist in fewer than 20 populations worldwide.

Our primary management goal is to protect habitat essential to the majority of the preserve's native plants and animals. This protection will be achieved, in large part, by continuing to eliminate pigs and control weeds. However, we will continue to assess other threats to the Preserve's rarest species and to implement control measures for these threats as appropriate.

Formal surveys were conducted annually at Kapunakea by botanists from the Hawai'i Natural Heritage Program. Their reports and accompanying maps are kept in Maui Field Office files. These Heritage surveys have yielded some significant results. For example, more than three-fourths of the endangered mahoe tree population (*Alectryon macrococcus* var. *macrococcus*) known on West Maui is concentrated in Kapunakea Preserve. Beginning with fiscal year 2004, formal rare plant surveys will be conducted biannually (every other year).

Maui field staff, using Hawai'i Rare Plant Working Group forms or casual observation, also routinely monitor various rare plants. This method has provided us with finding seed production for the preserve's rarest plant, *Colubrina oppositifolia*. This individual tree, an island record for Maui, is in serious decline due to the infestation of Black Twig Borer (*Xylosandrus compactus*). The seedlings are now being prepared for outplanting in Kapunakea Preserve's first active restoration project.

In FY1994, visiting malacologists surveyed two ridges for snails. They found all four of the species listed in Appendix 3. The full report of the survey, submitted by Dr. Mike Hadfield (cited in Appendix 4), recommends we control rats at snail population sites; however, at present this action is cost prohibitive given our NAPP budget (see prior section on Small Mammal Control). We will look for alternate sources of funding for a rat baiting program, perhaps from the U.S. Fish and Wildlife Service. Another site visit by Dr. Hadfield was conducted in FY2002, and we are awaiting the final report.

Activities

Years 1-6 (FY2004-09)

- Continue to search for and assess rare species populations, to assess protection needs, and to reduce threats.
- Maintain current maps of rare species populations.

Travel - helicopter	$550
Supplies	100
Subtotal (annually)	$650

Program 4: Community Outreach

Program Goal

To educate, empower, and engage the community in the preservation of their natural and cultural heritage from summit to sea.

Discussion of Methodology

In June 1993 we began to lead interpretive hikes on the Honokowai Ditch Trail. Monthly membership hikes and specially scheduled community hikes were conducted on this trail until it was permanently closed for safety reasons in February 2002. Interpretive hikes served as our most effective outreach tool for public education. Staff and volunteers who led these hikes were specially trained in the areas of native and alien species, natural and cultural history, trail safety, and the TNC principles of resource management at the local and global levels. As the WMMWP began to take shape, more information was added to the interpretive talks, which summarized the values of the partnership, its function, and its structure. With the closure of our only formal interpretive trail, staff members and qualified volunteer hike leaders will conduct hikes on lower portions of existing trails. TNCH will no longer provide scheduled monthly access to Kapunakea Preserve and other interpretive hikes will be infrequent.

Another effective means of public education is through conducting outreach visits to schools, cultural groups such as hula halau and canoe clubs, and civic clubs such as the Rotary and Kiwanis. The Outreach and Volunteer Coordinator will actively pursue opportunities to provide talks and slideshows by establishing contacts with school principals and headmasters, club presidents, and public relations directors. At the school level, visits involve pre-tests to determine students' prior knowledge, a slideshow that outlines Hawaii's natural and cultural history, and a post-test to measure the effectiveness of the session. Outreach visits to cultural groups will focus on the historical relationship between the Hawaiians and the land, and on the dependency that exists upon the health of our natural resources and the health of the human population. Presentations to civic clubs stress community involvement, and also outline the form and function of the WMMWP. Discussions with visitor industry

officials will be centered on the native ecology of Hawai‘i, and on the threats our ecology faces from introduced species and unwise human activities. A sense of duty and urgency will be the underlying message conveyed in all outreach presentations, directed towards the garnering of community support in the form of advocacy, monetary donations, and volunteer assistance.

The recruitment, training, and utilization of volunteers will continue. Volunteers significantly increase staff productivity by providing hundreds of hours of assistance in all areas of preserve management. All volunteers receive training in the identification of native and endangered species, as well as the existing invasive threats. Volunteers are also trained in helicopter safety, the use of hand tools, and in the proper application of herbicides. A recent increase in high school and college-aged volunteers is attributed to outreach visits to the schools. A considerable amount of these students show interest in conservation careers. A concerted effort will be made to provide opportunities for students to gain experience in the field, preparing them for college coursework and the pursuit of a conservation career. Our internship program will also continue with two interns per summer. Since November 1999, the Americorps program, run under the Maui Economic Opportunity's Youthbank, has provided TNCH with at least two full-time volunteers a year. These young men and women are full-time volunteers who receive a stipend and an educational scholarship award from MEO. Since 1999, Americorps volunteers have contributed over ten thousand person hours assisting staff in all areas of management and public outreach.

Activities

Years 1-6 (FY2004-09)

- Continue to recruit, train, and utilize volunteers in all areas of management.
- Continue regular outreach visits with targeted community members.
- Present slide shows and talks as requested by community and school groups.
- Lead special hikes for targeted community members.
- Participate in various parades and special events in the community

Supplies, printing, photos, and dues (annually)	$800

Program 5: Watershed Partnerships

Program Goal

Assist the long-term effective management of the native ecosystems of West Maui by the West Maui Mountains Watershed Partnership.

Discussion of Methodology

The West Maui Mountains Watershed Partnership (WMMWP) was formally established in November 1998 when all the major landowners with land holdings in the conservation district signed a memorandum of understanding. This agreement reflected all of the landowners' willingness to protect the forest across arbitrary ownership boundaries. A coordinator was hired in 2000 to provide for the continued funding of WMMWP projects and to hire and supervise field crews in the implementation of protection programs. With the approval of the WMMWP environmental assessment in 2001, the coordinator hired staff to begin fencing, ungulate removal, and resource monitoring programs for all of West Maui's native forests.

TNCH's Maui Field Office has actively participated in partnership activities from the beginning. We have attended partnership meetings where management priorities are discussed and progress on goals is evaluated by the partnership. Maui Field Office staff has also trained WMMWP crews in ungulate and weed removal, monitoring techniques, fence building, and a wide array of safety procedures including rappelling, helicopter travel, and wilderness survival. The Maui Field Office will continue to provide the WMMWP with advice and training, and we will participate in management activities on partnership lands as needed.

Activities

Years 1-6 (FY2004-09)

- Participate in partnership meetings to help set priorities for the WMMWP.
- Assist the WMMWP in accomplishing fundraising and management priorities

Program 6: Personnel, Equipment, and Facilities

Program Goal

Maintain staff and facilities required to implement the goals of The Nature Conservancy on Maui in a safe, productive environment.

Discussion of Methodology

TNCH's Maui field office is staffed by seven full-time stewardship positions that split time and effort between two preserves; approximately 30% is charged to Kapunakea and 70% to Waikamoi.[1] The Director of Maui Programs oversees all work and is responsible for planning, budgeting, and reporting activities. The Outreach & Volunteer Coordinator identifies individuals or groups to be targeted for hikes, talks, or volunteer trips in an effort to gain increased public support for TNCH's conservation programs. The Office Manager is responsible for tracking expenses, paying bills, reporting on the budget to the Director, and various administrative duties associated with running an office. The Maui Natural Resource Manager is responsible for the management of fieldwork in the preserve, along with participating in a number of outreach and restoration activities; in addition, some planning tasks are also a component to this position. The Invasive Plant Specialist is responsible for weed management, rare and endangered species monitoring, and coordinating scientific research in our preserves. The Field Coordinator is responsible for supervision of the Field Technician and any other field staff or volunteers

[1] Director of Maui Programs, Maui Natural Resource Manager, Office Manager, Outreach & Volunteer Coordinator, Invasive Plant Specialist, Field Coordinator, and Field Technician.

doing ungulate control work. The Field Technician is responsible for all threat control; this individual also assists with research and outreach activities. In addition, we also hire at least two summer interns each year. It should be noted that TNC's negotiated fringe benefit rate with the United States Agency for International Development, our cognizant federal agency, is currently 38.5%.

From a time and effort standpoint, roughly 40% of personnel time budgeted for Kapunakea is spent on ungulate control; 20% is also spent on weed control activities. The remainder of the personnel budget is divided among the following activities: monitoring (8%); rare species protection (2%); small mammal control (3%); community outreach (15%); and planning and administration (12%).

The Nature Conservancy's Honolulu office provides administrative, technical and annual planning support. In particular, the Coordinator of Landscape Conservation, the Ecologist, and other resource staff will help prepare annual plans and reports and develop and implement monitoring and research programs.

All full-time staff is provided training in first aid, CPR, and fire suppression. Field staff participates in a variety of emergency and safety training programs offered by cooperating state and federal agencies (fire training, helicopter safety, hunter safety, rappelling, etc.). Other training needs, such as computer, communication, and other skill building courses, are provided to staff on an individual, as needed basis.

Travel costs consist of airfare, ground transportation, board and lodging for TNCH staff traveling off-island, along with supervisory staff attending regular meetings at the Honolulu office. Because the NAP program requires an annual inspection, we have budgeted airfare for DOFAW staff to help cover expenses for this visit. Facilities costs include 30% of office and baseyard facilities incurred to support the Kapunakea Preserve program. Vehicles, field equipment, and any associated maintenance costs are also split between the two Maui preserves utilizing a 30-70 (Kapunakea-Waikamoi) split; we currently have four vehicles (all are four-wheel drive trucks). Supplies include the cost of fuel, insurance, and maintenance for the vehicles, along with the cost of general supplies needed to perform overall management activities. Contractual fees consist of technical assistance provided by Hawai'i Natural Heritage Program (HINHP) and National Tropical Botanical Garden's botanists, ecologists, and science staff, who assist with resource monitoring and research, and data compilation.

Activities

Year 1 (FY2004)

Personnel (Salaries and fringe)	$116,000
Contractual	6,900
Travel & Training	1,058
Facilities	22,000
Equipment & Supplies	7,000
NAP Inspection	130
Subtotal	$153,088

Year 2 (FY2005)

Personnel (Salaries and fringe)	$120,000
Travel & Training	4,000
Facilities	22,000
Equipment & Supplies	7,000
NAP Inspection	130
Subtotal	$153,130

Year 3 (FY2006)

Personnel (Salaries and fringe)	$124,000
Contractual	6,900
Travel & Training	4,000
Facilities	22,000
Equipment & Supplies	7,000
NAP Inspection	130
Subtotal	$164,030

Year 4 (FY2007)

Personnel (Salaries and fringe)	$128,000
Travel & Training	4,000
Facilities	22,000
Equipment & Supplies	7,000
NAP Inspection	130
Subtotal	$161,130

Year 5 (FY2008)

Personnel (Salaries and fringe)	$132,000
Contractual	6,900
Travel & Training	1,058
Facilities	22,000
Equipment & Supplies	7,000
NAP Inspection	130
Subtotal	$169,088

Year 6 (FY2009)

Personnel (Salaries and fringe)	$136,000
Travel & Training	4,000
Facilities	22,000
Equipment & Supplies	7,000
NAP Inspection	130
Subtotal	$169,130

BUDGET SUMMARY

The following tables summarize the 6-year budget for Kapunakea Preserve. Through the NAP program, the State of Hawai'i will fund two-thirds of the costs outlined in this Long-Range Plan. Recognizing that the NAP program budget is not expected to increase significantly in the coming years, we have not included routine, annual increases for most of the program activities described above. In addition, little provision has been made for possible future inflation or general cost increases, other than a 3% annual increase for salaries and fringe benefits. If significant cost increases occur over the course of this Plan, we may need to work with DLNR to revise goals or seek additional NAPP funds through an amended plan.

An overhead charge is included to recognize the administrative support provided by TNC; although TNC's current negotiated rate with the federal government is 25%, a maximum of 10% is allowable by the State. Thus, TNC will absorb the 15% in indirect cost differential as well as any future increases to, or other changes, in the overhead rate.

	FY2004	FY2005	FY2006	FY2007	FY2008	FY2009	Total
Non-Native Species Control:							
Ungulate Control	12,500	12,500	12,500	12,500	12,500	12,500	75,000
Invasive Plant Control	2,850	2,850	2,850	2,850	2,850	2,850	17,100
Small Mammal Control	0	0	0	0	0	0	0
Resource Monitoring	780	780	5,550	780	780	780	9,450
Rare Species Protection and Research	650	650	650	650	650	650	3,900
Community Outreach	800	800	800	800	800	800	4,800
Watershed Partnerships	0	0	0	0	0	0	0
Personnel, Equipment, and Facilities	153,088	153,130	164,030	161,130	169,088	169,130	969,596
Subtotal	**170,668**	**170,710**	**186,380**	**178,710**	**186,668**	**186,710**	**1,079,846**
Overhead (10%)	17,067	17,071	18,638	17,871	18,667	18,671	107,985
TOTAL	**187,735**	**187,781**	**205,018**	**196,581**	**205,335**	**205,381**	**1,187,831**

	FY2004	FY2005	FY2006	FY2007	FY2008	FY2009	Total
Kapunakea Budget	187,735	187,781	205,018	196,581	205,335	205,381	1,187,831
Match (1/3)	62,578	62,594	68,339	65,527	68,445	68,460	395,943
NAP REQUEST (2/3)	**125,157**	**125,187**	**136,679**	**131,054**	**136,890**	**136,921**	**791,888**

ENVIRONMENTAL REVIEW COMPLIANCE

All actions being proposed for reauthorization in this Long-Range Management Plan are substantially similar to, and relevant to, the actions previously considered in the *Final Environmental Assessment of Kapunakea* for which we received a "Finding of No Significant Impact" in 1997. Pursuant to Hawaii Administrative Rule 11-200-13 (*Consideration of previous determination and accepted statements*), all environmental review obligations under the Hawaii Revised Statutes (Ch. 343) have been fulfilled and are in keeping with the letter and intent of the administrative rules regulating the Natural Area Partnership Program (HAR 13-210).

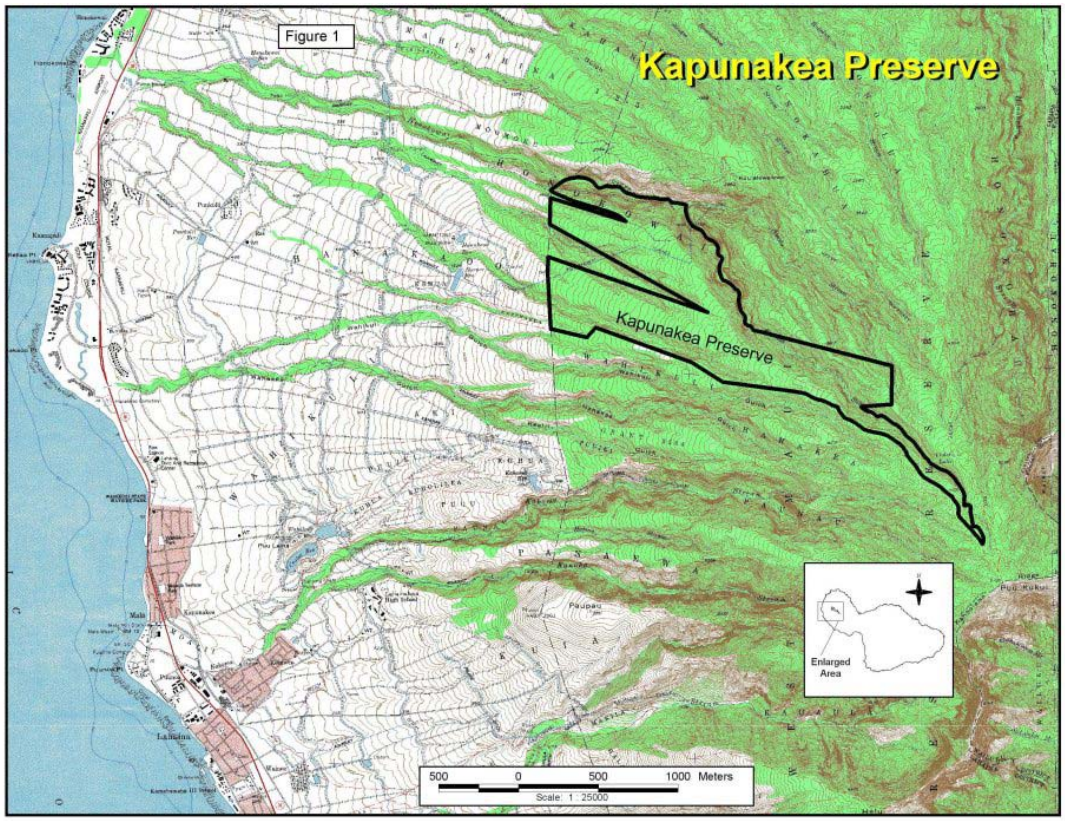
Figure 1
Kapunakea Preserve
Kapunakea Preserve
Enlarged Area
500 0 500 1000 Meters
Scale: 1 : 25000

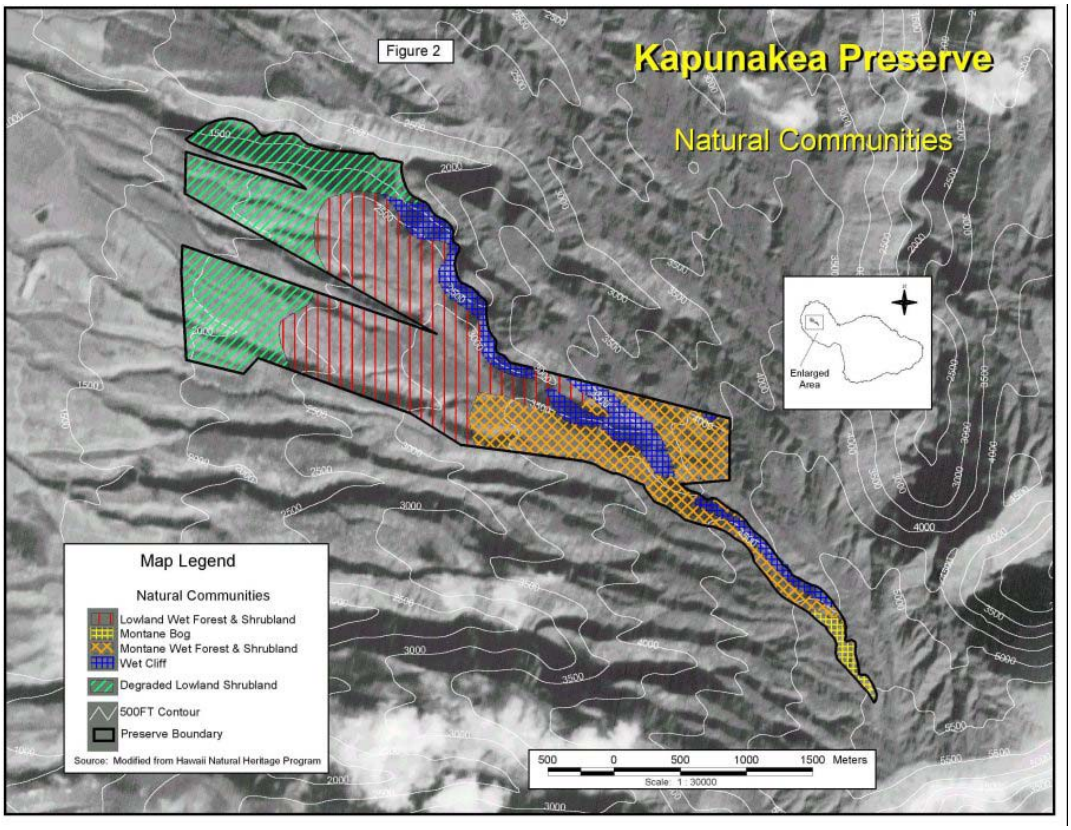
Figure 2
Kapunakea Preserve
Natural Communities
Enlarged Area
Map Legend
Natural Communities
Lowland Wet Forest & Shrubland
Montane Bog
Montane Wet Forest & Shrubland
Wet Cliff
Degraded Lowland Shrubland
500FT Contour
Preserve Boundary
Source: Modified from Hawaii Natural Heritage Program
500 0 500 1000 1500 Meters
Scale: 1 : 30000

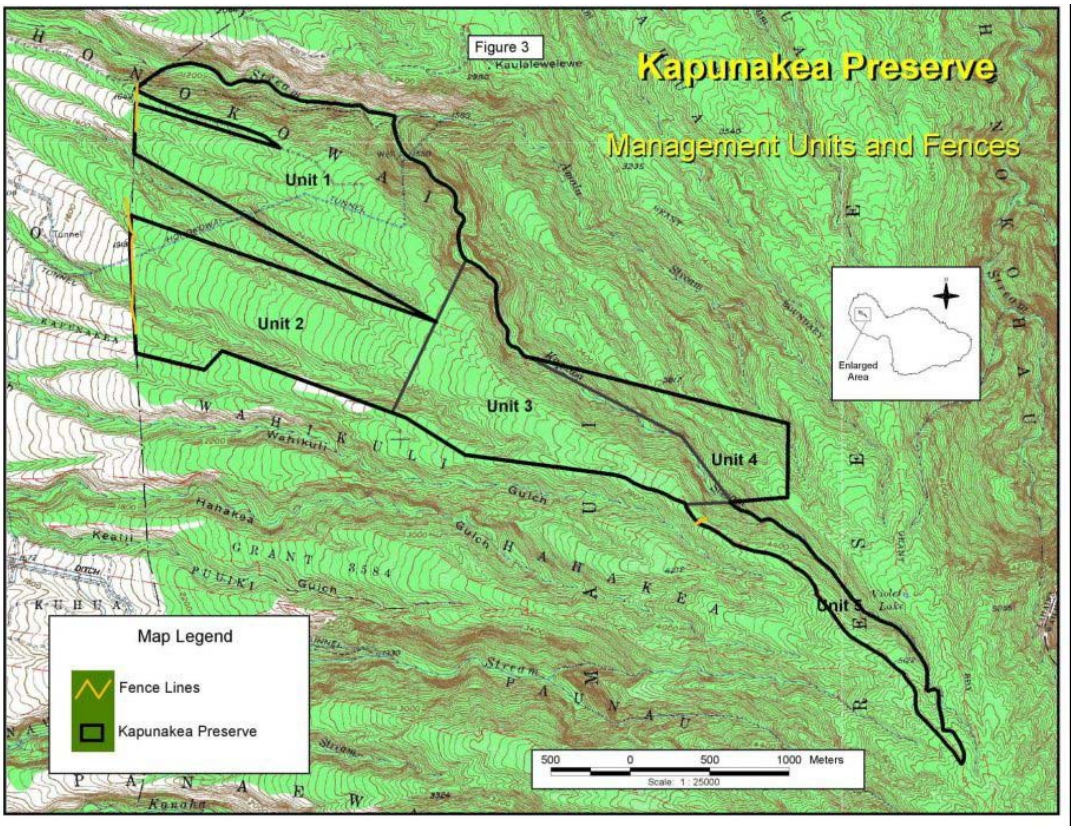
Figure 3
Kapunakea Preserve
Management Units and Fences
Unit 1
Unit 2
Unit 3
Unit 4
Unit 5
Enlarged Area
Map Legend
Fence Lines
Kapunakea Preserve
500 0 500 1000 Meters
Scale: 1 : 25000

APPENDIX 1
NATURAL COMMUNITIES OF KAPUNAKEA PRESERVE

NATURAL COMMUNITY	HERITAGE RANK(a)
Lowland:	
Koa/‘Ohi‘a (Acacia/Metrosideros) Lowland Mesic Forest^†	G3
Lama/‘Ohi‘a (Diospyros/Metrosideros) Lowland Mesic Forest^	G3
Mamaki (Pipturus) Lowland Wet Shrubland	G3
‘Ohi‘a (Metrosideros) Lowland Mesic Forest^†	G3
‘Ohi‘a (Metrosideros) Lowland Mesic Shrubland	G3
‘Ohi‘a/Uluhe (Metrosideros/Dicranopteris) Lowland Wet Forest^	G3
Uluhe (Dicranopteris) Lowland Wet Shrubland	G4
Montane:	
‘Ohi‘a (Metrosideros) Mixed Montane Bog	G2
‘Ohi‘a (Metrosideros)/Mixed Shrub Montane Wet Forest	G3
‘Ohi‘a /‘Olapa (Metrosideros/Cheirodendron) Montane Wet Forest	G3
Aquatic Communities:	
Hawaiian Intermittent Stream	G4

(a) Heritage Rank:
- G2 = Imperiled globally (typically 6 to 20 current occurrences).
- G3 = Restricted range (typically 21 to 100 current occurrences).
- G4 = Apparently secure globally (>100 occurrences).

^ = Not known from West Maui NAR.
* = Not known from Puu Kukui WMA.

APPENDIX 2
RARE NATIVE PLANTS OF KAPUNAKEA PRESERVE

SCIENTIFIC NAME	COMMON NAME	HERITAGE RANK (a)	FEDERAL STATUS (b)
Acacia koaia†	koai‘a, koai‘e, koa‘oha	G2Q	
*Alectryon macrococcus var. macrococcus^*	‘ala‘alahua, mahoe	G2T2	LE
Argyroxiphium caliginis	‘eke silversword	G1	
Bobea sandwicensis^†	‘ahakea	G2	
Bonamia menziesii^†	-	G2	LE
Calamagrostis expansa	-	G2	
Colubrina oppositifolia^†	kauila	G1	LE
Ctenitis squamigera	pauoa	G1	LE
Eurya sandwicensis	anini, wanini	G2	
Exocarpos gaudichaudii†	Heau	G1	
Geranium humile	Nohoanu, hinahina	G1	
*Hedyotis formosa^*	-	G1	
Hibiscus kokio ssp. *kokio†*	koki‘o ‘ula‘ula	G2T2	
Lagenifera maviensis	howai-a-ulu	G2	
*Melicope orbicularis**	alani	G1	
Myrsine vaccinioides	kolea	G1	
Neraudia melastomifolia^†	ma‘aloa, ma‘aloa, ‘oloa	G2	
Nothocestrum latifolium^†*	‘aiea	G1	
*Phyllostegia bracteata**	-	G1	
Phyllostegia stachyoides†*	-	G1	
Platanthera holochila	-	G1	LE
Ranunculus mauiensis^†	makou	G2	
Santalum freycinetianum var. *lanaiense†*	‘iliahi, sandalwood	G3T2	LE
Sicyos cucumerinus†	‘anunu, kupala	G1	

Number of rare plants in Kapunakea	24
^ = Not known from West Maui NAR	8
† = Not known from Pu‘u Kukui WMA	12
* = Known from preserve historically (pre-1975)	3

(a) Heritage Rank:
- G1 = Species critically imperiled globally (typically 1 - 5 current occurrences).
- G2 = Species imperiled globally (typically 6 - 20 current occurrences).
- G3 = Species has restricted range (typically 21 - 100 current occurrences).
- GH = Species possibly extinct.
- Q = Questionable taxonomic assignment.
- T1 = Subspecies or variety critically imperiled globally.
- T2 = Subspecies or variety imperiled globally.
- TH = Subspecies or variety possibly extinct.

(b) Federal Status:
- LE = Listed as endangered.

APPENDIX 3
RARE NATIVE LAND SNAILS OF KAPUNAKEA PRESERVE

SCIENTIFIC NAME	HERITAGE RANK (a)
Partulina crocea†	G?
Partulina perdix	G1
Partulina tappaniana	G1
Perdicella kuhnsi	-

† = Not known from Pu‘u Kukui WMA.

(a) Heritage Rank:
G1 = Species critically imperiled globally (typically 1 to 5 current occurrences).
G? = Insufficient data available to assign definite rank.
- = HINHP does not yet rank this taxon.

APPENDIX 4
RELATED DOCUMENTS

Hadfield, M.G. Undated. *Report on a Survey of Achatinelline Tree Snails in Kapunakea Preserve, Maui, September 10–12, 1993*. Unpublished report prepared for The Nature Conservancy.

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The Nature Conservancy of Hawai‘i. *Operational Plan and Progress Report*, *Kapunakea Preserve, West Maui, Hawai‘i.* Unpublished document prepared for the Department of Land and Natural Resources Natural Area Partnership Program and Amfac/JMB Hawai‘i, Inc. Prepared annually; reports for 1992 – 2002 are available.